CLAIMS

1. A control apparatus for a hydraulic cylinder, comprising:

a hydraulic cylinder including a piston slidably disposed in a cylinder tube and a pair of oil chambers defined by the piston;

a cushion chamber disposed in the vicinity of each end of the hydraulic cylinder to throttle inflow or outflow of an operating oil caused by the piston moving close to a piston stroke end;

a pressure sensor to detect pressure of the cushion chamber;

a control valve disposed in a passage to supply/drain the operating oil to and from the oil chambers of the hydraulic cylinder for varying a flow amount of the operating oil; and

a controller to determine a piston stroke end range based upon an output of the pressure sensor, and vary an opening degree of the control valve to lower a moving speed of the piston at the piston stroke end range.

2. The control apparatus for the hydraulic cylinder according to claim 1, wherein:

the control valve includes a flow control valve to adjust a supply flow amount of the operating oil to the hydraulic cylinder by a drive current sent from the controller.

3. The control apparatus for the hydraulic cylinder according to claim 1, wherein:

the control valve includes a flow control valve to adjust a drain flow amount of the operating oil flowing out from the hydraulic cylinder by a drive current sent from the controller.

4. The control apparatus for the hydraulic cylinder according to claim 1, wherein:

the controller determines that the piston enters into the piston stroke end range based upon when a pressure detection value in the cushion chamber goes beyond a predetermined value, and reduces the opening degree of the control valve within the piston stroke end range for lowering a moving speed of the piston.

5. The control apparatus for the hydraulic cylinder according to claim 4, wherein:

when the controller determines that the piston enters into the piston stroke end range, the controller increases deceleration degrees of the moving speed of the piston in accordance with an elapse time after the piston enters into the piston stroke end range.

6. The control apparatus for the hydraulic cylinder according to claim 4, wherein:

when the controller determines that the piston enters into the piston stroke end range, the controller calculates the moving speed of the piston relative to the flow amount of the operating oil based upon the pressure detection value of the cushion chamber and the opening degree of the control valve, and increases deceleration degrees of the moving speed of the piston.